Methane Mitigation Procedures for Private Wells

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by: Brandon Mantel

Methane… Stray Gases…

- How do people identify a problem?
- What problems does this cause?
- Options for treating and dealing with methane
- Aeration Methods
- Installation Considerations
- Compliance Requirements
- Cost Factors

How do people identify a problem?

Historically…

- Air spurts in water faucets
  * More in hot than in cold water
- Pump would become air-locked
  * Stops pumping until static comes back up
- “Whitish” look to water
  * Also very common with other gases
  * Most of the time it indicates just carbon dioxide or dissolved oxygen.
- Driller or Pump Installers igniting the well

How do people identify a problem?

Cont'd

Current Methods…

- Lab testing for methane driven by Oil & Gas Industry
- Which has resulted in:

  * The current trend among homeowners is to delay treatment of methane mitigation systems.

  * People are blaming the O&G industry so they are dragging their feet for any expenditures to mitigate.

  * People feel that if they are under the enforcement threshold, they don't have to do anything.

What problems does this cause?

- Besides the known affects of methane being flammable, waters with other gases are often corrosive.

- Carbon Dioxide is corrosive to plumbing, causing higher copper and lead levels.
- Dissolved Oxygen at high levels is corrosive.
- Faucet fixtures bear the brunt of the damage by the little bubbles exploding as they're exposed to atmospheric pressures.

What problems does this cause?

Cont'd

- Hydrogen Sulfide is a gas that not only smells, but is an acid which can react with metals, causing corrosion.

Options for Treating and Dealing with Methane

- OAC 3701-28-10 provides both passive and active methane mitigation methods
- Ohio's action level is 10ppm or greater of dissolved methane.
- Passive venting describes methods that safely handles and encourages the natural venting of un-dissolved methane.
- Active mitigation is a method that involves depressurizing the water and re-pressurizing once the gas has been removed at atmospheric pressure.

Passive Venting

- Venting the well borehole with a vented well cap with a minimum of 1” screened opening and extended to a height which will prevent combustion of normal activities around the home.
- The concentration and volume of methane being released from the borehole could be substantially greater than the level of dissolved methane in the water
- This may require redirecting the well venting to a higher elevation by extending the well casing or by directing the off gassing to another location on the property through the use of vented pipe.

Passive Venting – cont'd

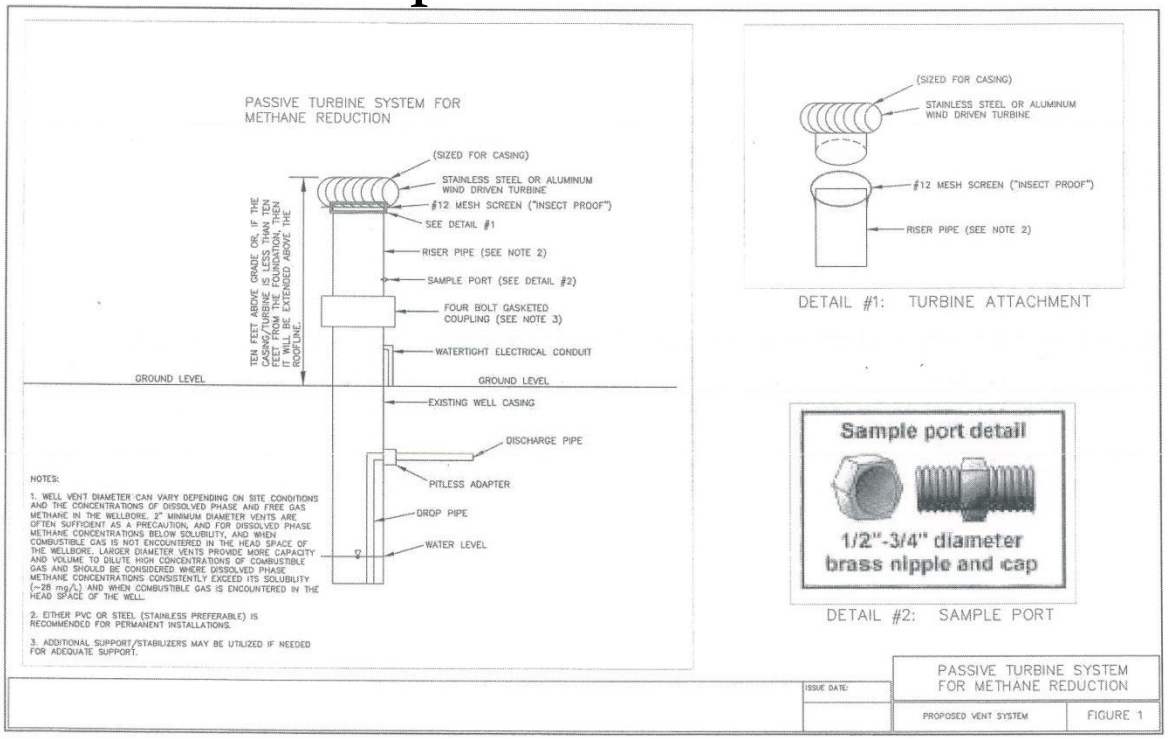
Typical Well Cap Approved for most applications

Sealed Well Cap to allow redirecting of Gases

Passive Turbine method recently approved

Passive Venting – cont'd

- The Passive Turbine method was recently approved by the director for moving the off gassing of methane which would build up in the borehole.



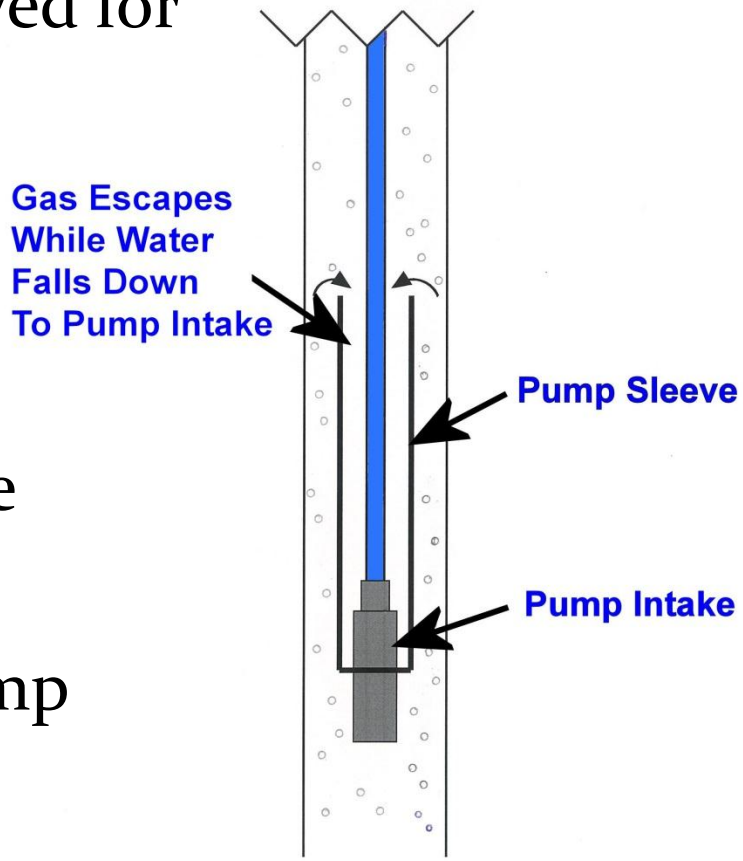
Passive Venting – cont'd

- Pressurized Tank Method equipped with Air Draw and Air Release. This was used more successfully years ago, but would not meet the requirements of current code.

The drain back method would create opportunities for depressurizing which would help release the methane, but was not found to be a consistent treatment method.

Passive Venting – cont'd

- Pump Shroud or Sleeve is allowed for methane mitigation
- This involves a shroud that is placed over the pump which forces water to flow over the top, separating out the gas bubbles which would help reduce the opportunity for pump air lock.

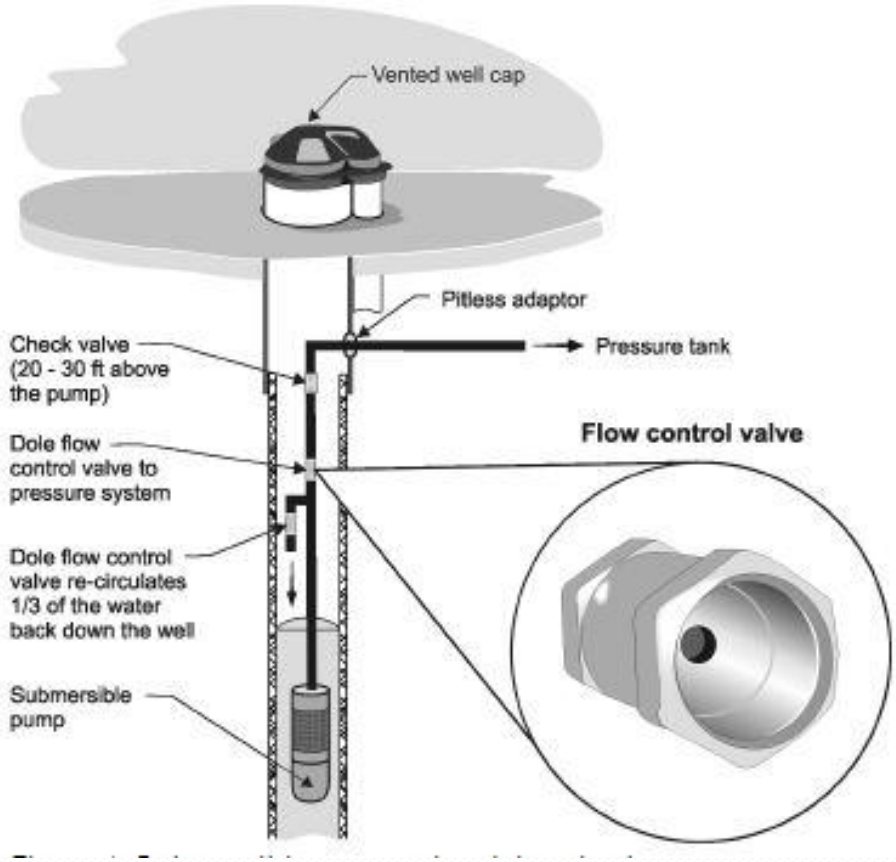


Passive Venting – Pump Depth

- Sometimes changing the pump depth setting can reduce the problems associated with methane gas
- If the methane is being introduced into the well above the water production zone, setting the pump deeper may avoid the intake of the gas which could cause the pump to air lock.
- If the methane is being introduced deeper in the well, and there is available pumping height above the pump, raising the pump up may allow the gases to separate out and escape through the borehole

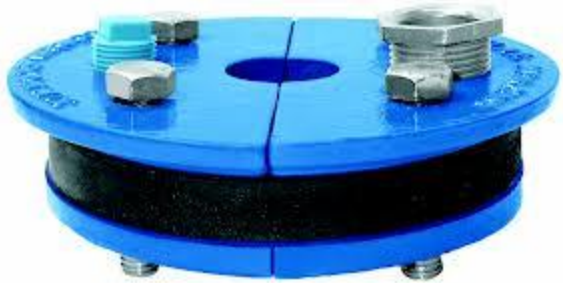
Passive Venting – Flow Control

- Occasionally there is enough separation of gases which could displace the water in the pump head so it becomes air locked resulting in no water being pumped
- A flow control can be used to divert 1/3 of the water back down the well to eliminate air locking



Passive Venting – cont'd

- Wells inside houses pose a special consideration.
- Well seals should not be relied upon by themselves. If methane is known to be produced by a well located inside the house, venting is important to prevent the well from breathing methane into the basement
- Ohio requires these wells to be vented outside.



Passive Venting – cont'd

- The industry's experience is that though passive venting is an important measure to control methane gases by providing safety to life and property as well as more reliable pumping, it has not significantly helped reduce dissolved methane in water.

Active Gas Mitigation

- The most common method to remove methane from water is the aeration method.
- There are two common industry methods of aeration – Air Induction and Air Stripping
- These systems pump water from the well into a reservoir which separates out the gas by dispersing the water and depressurizing to atmospheric pressure.
- The systems then re-pressurize the water using a second pump which provides water to the household

Air Induction Method

- This method involves the use of a venturi to draw air into the water stream as it flows into a sealed tank. This volume of air drawn into the tank creates a positive air pressure which causes the methane to be vented outside.
- 3.0 cu.ft. per minute air movement

Air Stripping Method

- This method uses a spray bar with nozzles to diffuse the water which separates out the gas from the water. A blower fan creates a negative pressure on the tank and blows the methane gas out outside through the vent.


METHANE BLOWER & VENT PIPE
SPIRAL ACTION AERATION NOZZLES MANIFOLD
OVERFLOW PIPE
FLOAT SWITCH
SAFETY FLOAT SWITCH
AERATION TANK
AERATED WATER
PUMP
BALL VALVE (DRAIN)
SOLENOID VALVE
PRESSURE GAUGE
SERVICE PRESSURE TANK
TO SERVICE
EXISTING WELL PUMP & PRESSURE TANK

Venting Methane

- Ohio rules require the vent to extend beyond the edge of the roof top or vented no less than 10’ from the foundation of the house.
- Vent discharge pipe should terminate with a downturned screened pipe or fitting to prevent insects or vermin from entering the water system.
- Any additional manufacturer installation guidelines must be followed

Aeration Installation Considerations

- Temperature of water is very important for an effective methane mitigation.
- Methane will not separate from water if temperature is below 42 degrees Fahrenheit
- Maximum effectiveness of methane removal requires a temperature of 58 degrees Fahrenheit or higher
- Just keeping the system from freezing is not adequate for removal of methane

Aeration Installation Considerations Cont'd

- Most Aeration systems on the market store 100 – 130 gallons of water. This stored water continues to release the final amount of dissolved methane as the ambient temperature warms up the water in the aeration resevoir
- It is important to properly support the aeration system. The complete water system can weigh between 1000 to 2500 pounds depending upon treatment equipment

Aeration Installation Considerations Cont'd

- Water quality issues such as iron should be considered when designing an aeration system
- Iron will be oxidized within the aeration tank which could cause red water situations. This should be evaluated prior to installation to determine the proper iron treatment to coordinate with the aeration system
- Sediment filters are helpful in protecting the equipment when sand or sediment is being produced by the well

Aeration Installation Considerations Cont'd

- A pressure gauge should be installed prior to aeration equipment. Induction aeration system require a certain amount of back pressure to ensure proper air draw. Others require back pressure for proper diffusion. Higher than normal or increasing back pressure indicates plugging or blockage.
- A minimum back pressure of 10psi is recommended for all aeration systems for best performance.

Aeration Installation Considerations Cont'd

- Though not required, chlorination is always recommended with an open reservoir tank.

Aeration Installation Considerations Cont'd

- Fan operated aeration systems should operate to ensure the fan is operating at a minimum of when the spray bar is operating. A common mistake is to not have the fan operating at the same time the well pump is operating. The fan should not be controlled by a separate float from the well pump operated float.
- Aeration equipment can directly operate the well pump or a supply solenoid valve.

Methane Considerations

- Water treatment equipment installed prior to aeration equipment should not have the backwash drains discharge inside houses or buildings.
- Methane can separate within the equipment and be released during backwash with high concentrations.

Compliance Requirements

- Check valve is required after the aeration system
- 3701-28-08 (P) Requires a dual check valve prior to entering a non-pressurized reservoir tank
- 3701-28-08 (F)(1) A smooth nosed sampling faucet is required ahead of the aeration tank in order to obtain sampling from the well prior to any treatment
- It would be best to install the sample faucet between the well and the dual check valve to provide a small back pressure while sampling and to test for failed check valves in the well

Cost Factors

- Most aeration systems cost between $2500 – $5000.00
- The costs will vary depending upon installation complexities
- Electrical requirements may require additional subpanel or breakers
- Chlorination or de-chlorination will affect cost
- Pre-treatment requirements
- Re-pressurization pumping system options
- Minor construction requirements – venting, etc…

Brandon Mantel
Donamarc Water Systems Co.
brandon@donamarc.com
330-896-4949

Ohio Water Well Association
http://ohiowaterwell.org